A SNEAK PEAK INTO THE JOURNEY OF COVID 19

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IWSA interns from Jaihind college
studied the Scientific timeline of Covid 19
The mentors interacted with them biweekly for a month.

Dr. Surekha Zingde, Trustee IWSA explained to the interns the construction and design of a survey form

Dr. Gita Sharma, Director Research & Quality Control, Tapadia Diagnostics and IWSA member from Hyderabad gave a talk on Covid 19---Pandemic, where she covered the following points

- Biology of the virus & the emerging variants
- About Corona-the disease
- Preventive Measures
- Symptoms, diagnosis & treatment
- Prophylaxis vaccines
- Types of vaccines & regulatory framework
- Immunity

In December 2019, a type of Coronavirus, causing a cluster of pneumonia cases and deaths, emerged in **Wuhan,** China, and spread out to other countries worldwide. The etiological agent behind the current pandemic of COVID-19 was Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2). Coronaviruses are enveloped and highly diverse RNA viruses comprising a large (25–32 kb), single-stranded, positive-sense RNA genome of ~30 kb. There are four subfamilies of coronavirus, namely alpha-; beta-(originating mainly from mammals, particularly from bats); gamma- and delta. Among these alpha and beta coronaviruses are known to cross animal–human boundaries and cause serious sickness and death. These coronaviruses can infect humans as well as a variety of other vertebrates, causing respiratory, intestinal, hepatic, and neurological illnesses (Gohil et al. 2020). Mathematical models have suggested that the dramatic reduction in total outbreak size and peak prevalence is possible by increasing the proportion of the population who maintain safe distance from each other and the proportion of the asymptomatic population who are detected and isolated from the other susceptible population at a certain level. The detection using diagnostic kits and hospitalization rate should also increase (Biswas et al 2021).

As the global SARS-CoV-2 pandemic expands, genomic epidemiology and whole genome sequencing are being constantly used to investigate the transmissions and evolution. The SARS-CoV-2 viral genome shows 88% and 50% genetic homology with SARS-CoV and MERS-CoV, respectively and belongs to the order Nidovirales, family Coronaviridae, subfamily Ortho coronavirinae, and genus beta coronavirus (Gohil et al. 2020). The virus can also cause severe infections resulting in septic shock, acute respiratory distress syndrome, acute cardiac injury, acute kidney injury, and multi-organ failure, which necessitate intensive care unit admission, thus proving to be fatal. The SARS-CoV-2 surface spike (S) protein mediates entry into host cells by binding to the host receptor angiotensin-converting enzyme 2 (ACE2) via its receptor-binding domain (RBD). Though SARS-CoV-2 virus currently has a lower mortality rate than MERS, the infectious rate of SARS-CoV-2 has posed a challenge to the specific developmentof COVID-19 disease therapeutics (Gohil et al. 2020).

The onset of the second wave In India has seen rising cases with a case fatality rate of 1.24% (363,079 deaths). Multiple factors have been implicated to be involved in driving the second wave of COVID-19 in India, such as the complex interplay of mutant strains, secondary infections, violation of COVID appropriate behaviour, and government and public complacency on initiation of the vaccination drive. The secondary infections were mainly hospital acquired. The overuse of drugs has also made the organism resistant; however, the incidence of bloodstream infections is low for COVID-19 patients (Rajni et al 2021). Since SARS-CoV-2 directly affects the airway epithelium it also allows invasion of fungus like Mucormycosis and Aspergillosis (Barauh et al 2021). These fungal infections mainly caused pulmonary infections and were commonly observed in patients with diabetes, hypertension and comorbidities(Sonam et al.,2021).

RNA viruses like SARS-CoV-2 frequently adopt mechanisms of genetic variation through mutation to increase infectivity and mortality rate for their better survival (Sahoo et al., 2021). The Alpha strain (B.1.1.7), which originated from the UK, has accounted for an increase from 3% of cases in October 2020 to 96% of cases by February of the following year, resulting in a second wave across the country. B.1.1.7 gradually dominated in the US because of its high transmission rate and lethality, which is 30-70 percent more than the original strain found in Wuhan, China. The Beta strain (B.1.351) was first spotted in South Africa in May 2020, which was only announced in December and was said to affect younger age groups compared with previous variants. The emergence of new SARS-CoV-2 lineage B.1.618, a “variant of concern” in India, has been associated with a surge in daily infections. It is characterized by the presence of three mutations, E484Q, L452R and P681R increasing the severity of the transmission (Darling et al 2021, Sahoo et al 2021). L452R mutation enhances ACE-2 receptor binding by the virus and interferes with the action of existing antibodieson the mutated S-protein

The SARS-CoV-2 virus can multiply in both respiratory and digestive tracts and raise the prospect of fecal–ora transmission. It affects the anatomy and physiology of the gastro-intestinal tract by creating dysbiosis in gut microbiota for a lor period. This influences pulmonary dysfunction by modulating the immune responses of neutrophils, T cell subsets and so on. It ha been reported that probiotics show significant microbial inhibitory properties through alveolar macrophage, neutrophils, natura killer cells, and increased levels of pro-inflammatory cytokines like TNF-α and IL-6 in the lung. In addition, probiotic bacteria car bind the invading virus and inhibit the pathogen-host cell receptor interaction. Therefore, the use of probiotics as medicatior restricts respiratory viral infections by fortifying the mucosal immunity (Gohil et al. 2020).

The B.1.617 variant does seem to have an advantage over previously circulating versions of the virus, especially in individuals whose immunity is waning a while after previous infection or vaccination. The first trial phase of the vaccine in human started in October 2020. Covishield, being the first vaccine to be approved in India, is a viral vector vaccine that uses an adenoviru found in Chimpanzees, ChAD0x1, to deliver spike proteins and mount a tolerable immune response in response to a live virus. I has a proven efficacy rate of 70% which can be scaled up to 91% when both doses are administered 8-12 weeks apart. India's firs domestic COVID-19 vaccine Covaxin, developed and manufactured by Bharat Biotech International Limited, is an inactivated-viru vaccine. It has an efficacy of 93.4% against severe COVID-19 disease, and an overall vaccine efficacy of 77.8% against symptomati infections confirmed by PCR tests. Against asymptomatic COVID-19, the efficacy was 63.6%. The vaccine also conferred 65.2% protection against symptomatic infection with the Delta variant, at least two weeks after the second dose.

Strong mucosal cellular and humoral immune responses have the potential to induce sterilizing immunity by impeding pathogen binding to and uptake across epithelial surfaces. Advancing and improving existing vaccines requires innovative adjuvant approaches and delivery strategies. Mucosal vaccination strategies hold great promise to address this unmet need, providing more robust mucosal immunity and an alternative to parenteral vaccination. However, there are significant hurdles to mucosal vaccine development, including incomplete knowledge of the nature of protective mucosal immune responses (Lavelle et al 2021).

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